

22U308

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Name: .....

Reg.No: .....

**THIRD SEMESTER B.Sc. DEGREE EXAMINATION, NOVEMBER 2023**

(CBCSS - UG)

(Regular/Supplementary/Improvement)

**CC19U STA3 C03 - PROBABILITY DISTRIBUTIONS AND SAMPLING THEORY**

(Statistics - Complementary Course)

(2019 Admission onwards)

Time : 2.00 Hours

Maximum : 60 Marks

Credit : 3

**Part A** (Short answer questions)

Answer *all* questions. Each question carries 2 marks.

1. Name the distribution possessing lack of memory property in (i) discrete distributions and (ii) continuous distribution.
2. Obtain the mean of Uniform distribution(discrete type).
3. Define Standard Normal distribution.
4. Define log-normal distribution.
5. Define Pareto distribution.
6. Define sample variance.
7. State Weak law of large numbers.
8. Mention any two disadvantages of stratified random sampling.
9. If  $X \sim N(\mu, \sigma)$ , what about its mean and variance? Also compare with distribution of sample mean  $\bar{X}$ .
10. Let  $X_1, X_2, \dots, X_{10}$  be a random sample taken from the normal population with mean 9 and variance 16. What is the mean and standard deviation of sample mean  $\bar{X}$ ?
11. If  $\chi^2 \sim \chi^2_{(10)}$ . Find (a)  $E(\chi^2)$  (b)  $M_{\chi^2}(t)$
12. Define student's t distribution.

**(Ceiling: 20 Marks)**

**Part B** (Short essay questions - Paragraph)

Answer *all* questions. Each question carries 5 marks.

13. If  $X$  is a Poisson variate and  $P(X = 0) = P(X = 1) = k$ , find  $k$ .
14. State and prove 'lack of memory property' of geometric distribution.

15. Define Exponential distribution. Derive the mgf of Exponential distribution?
16. The probability of survival in case of cancer is found to be 0.8. One hundred people are attacked by the disease in a particular area. If 'X' denotes the number of survivals, assuming X follows binomial distribution with  $n=100$  and  $p=0.8$ , find an upper bound for the probability that the number of survivals will be either less than 68 or greater than 92.
17. Explain cluster sampling.
18. Derive the distribution of  $\frac{ns^2}{\sigma^2}$ . Write its p.d.f.
19. State the mean and mode of F distribution. Hence discuss its nature of probability curve of it.

**(Ceiling: 30 Marks)**

**Part C (Essay questions)**

Answer any **one** question. The question carries 10 marks.

20. State and prove Tchebycheff's Inequality.
21. If  $t \sim t_{(n)}$ , prove that  $t^2$  follows  $F(1, n)$  degrees of freedom.

**(1 × 10 = 10 Marks)**

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